Amendments to the Specification

Please amend the specification as follows.

Please amend the paragraph beginning at page 1, line 4, as follows:

This application is a divisional application of Serial No. 10/446,052, filed May 28, 2003, which is a divisional application of Serial No. 09/547,879, now U.S. patent number 6,613,170 filed April 12, 2000.

Please amend paragraph [0004], at pages 1-2, as follows:

[0004] Meanwhile, in recent years, use of a shorter laser wavelength and an objective lens having a larger numerical aperture (NA) has been studied in order to achieve higher density of the optical disk. However, the shorter wavelength and the larger numerical aperture ~~reduces~~ reduce an allowable value of an angle of inclination, (tilt) of the optical disk relative to a direction of incidence of the laser beam. Reduction of thickness of the substrate is effective for increasing the allowable value of the tilt. For example, in a digital video disk (DVD) having a laser wavelength of 650 nm and a numerical aperture of 0.60, the substrate has a thickness of 0.6 mm. Since mechanical strength of the single substrate of 0.6 mm in thickness is small, the two substrates are bonded to each other such that information recording faces of the substrates confront each other.

Please amend paragraph [0018], at pages 6-7, as follows:

[0018] Accordingly, a first object of the present invention is to provide, with a view towards eliminating the above-mentioned drawbacks of prior art, a method of and an apparatus for manufacturing an optical information recording medium, in which filling of resin at an innermost periphery of substrates can be controlled to an arbitrary position, regardless of whether or not a stopper is provided at the innermost periphery of the substrates, ~~is~~ or regardless of a position of the stopper, whereby an optical disk having a high mechanical strength and good external appearance, in which a filling position of the resin at the innermost periphery of the substrates is fixed, can be manufactured at high yield and at low cost.

Please amend paragraph [0044], at page 10, as follows:

[0044] Here, a method in which when UV cure resin is diffused between two substrates, a filling position of the UV cure resin at an innermost periphery of the substrates is controlled by irradiating UV rays only to an innermost peripheral region of the substrates, according to a first embodiment of the present invention is described with reference to Figs. 1A-2. In Fig. 1A, substrates 1 and 2 are identical with each other and each of the substrates 1 and 2 is a polycarbonate substrate produced by injection molding and having a thickness of 0.6 mm and a diameter of 120 mm. A central bore 20 of each of the substrates 1 and 2 has a diameter of 15 mm. Information signals are preliminarily recorded as pits on one face of each of the substrates 1 and 2, which act as ~~a~~ signal recording faces. A reflective layer 3, mainly consisting of aluminum and having a thickness of about 100 nm, is provided on the signal recording face of the substrate 1. Thus, by irradiating a laser beam from the other face of the substrate 1, playback of the information signals can be performed. The substrate 2 is a dummy substrate which is bonded to the substrate 1, so as to increase its mechanical strength. A reflective layer is not provided on the dummy substrate 2.

Please amend paragraph [0047], at page 11, as follows:

[0047] Further, the UV cure resin 11 is also diffused to an inner periphery of the substrates 1 and 2. The present invention is characterized by a method of accurately controlling a position for stopping this diffusion of the UV cure resin 11 to the inner periphery of the substrates 1 and 2. This method is described with reference to Figs. 1B and 2. When the substrates 1 and 2 are rotated at a high speed by the motor 150, UV rays 8 are irradiated by a UV lamp 6 only to a UV irradiation region 10, ~~i.e.~~ i.e., a region of the substrate 2, which is disposed radially inwardly of an innermost peripheral position for stopping diffusion of the UV cure resin 11. By changing a height and size of a UV shielding cover 7 for shielding the UV rays 8 of the UV lamp 6, the UV irradiation region 10 can be arbitrarily controlled regardless of a shape of the substrates 1 and 2.

Please amend paragraph [0054], at pages 14-15, as follows:

[0054] A still further modification of the method of the first embodiment is described with reference to Fig. 6. In this modification, when UV rays 59 are irradiated to a whole of a substrate 52, so as to wholly cure UV cure resin 54 after the UV cure resin 54 has been fully diffused between substrates 51 and 52, the integral substrates 51 and 52 are gripped between two flat plates, ~~e.g.~~ e.g., a substrate holder 56 and a transparent disk-like glass plate 57 so as to be subjected to a load. More specifically, the UV cure resin 54 is already filled between the substrate 51 having a reflective layer 53 formed thereon and the dummy substrate 52. In the method of the present invention, since the UV cure resin 54 is diffused between the substrates 51 and 52 while UV rays are being irradiated to an innermost peripheral region of the substrate 52, an annular cured region 55 in which the UV cure resin 54 is cured is formed at a boundary of the innermost peripheral region of the substrate 52. In this state, the substrates 51 and 52 are placed on the substrate holder 56 and then, the glass plate 57 is placed on the substrates 51 and 52 so as to apply the load to the substrates 51 and 52 such that tilt of the substrates 51 and 52 is reduced for correction. Since UV rays are transmitted through the glass plate 57, the UV rays 59 are irradiated to the whole of the substrate 52 from above the glass plate 57 by a UV lamp 58, so as to wholly cure the UV cure resin 54. A tilt of a thus obtained optical disk is made smaller than that in the case where a load is not applied to the substrates 51 and 52. This effect of reducing tilt of the optical disk becomes greater as the substrates 51 and 52 became thinner.

Please amend paragraph [0060], at pages 16-17, as follows:

[0060] Generally, it is known that in a case where light whose quantity is represented by "K" is incident upon a medium having a refractive index of n2 from a medium having a refractive index of n1, $\{Kx(n2-nl)^2/(n2+n1)^2\}$ is reflected and $[Kx(1-(n2-n1)^2/(n2+n1)^2\}]$ is transmitted. If the substrates 61 and 62 have a refractive index of 1.6 and light whose quantity is represented by "L0" is incident on the substrate 62 when the UV cure resin 66 is not filled in an inner peripheral region of the substrates 61 and 62, as shown in Fig. 7B, a quantity of reflected light R1 and a quantity of transmitted light T1 approximately assume (0.18xL0) and (0.82xL0), respectively. On

the other hand, if the UV cure resin 66 has a refractive index of 1.6 and the UV cure resin 66 has been filled in the inner peripheral region of the substrates 61 and 62, as shown in Fig. 7C, a quantity of reflected light R2 and a quantity of transmitted light T2 approximately assume (0.10xL0) and (0.90xL0), ~~respectively~~ respectively, for the following reason. Namely, since the refractive indexes of the substrates 61 and 62 are equal to that of the UV cure resin 66, reflection at an interface between the substrates 61 and 62 and the UV cure resin 66 is substantially eliminated. Thus, upon filling of the UV cure resin 66 in the inner peripheral region of the substrates 61 and 62, a quantity of reflected light changes from 18 % to 10 %, while a quantity of transmitted light changes from 82 % to 90 %. Such a change of quantity of light may be detected by a photodetector.

Please amend paragraph [0061], at pages 17-18, as follows:

[0061] One example of the photodetector for detecting a change of quantity of reflected light or quantity of transmitted light is shown in Fig. 8, in which a dummy substrate 82 is bonded by UV cure resin 84 to a substrate 81 having a reflective layer 83 formed thereon. A laser beam 86 emitted from a laser diode 85 is turned into collimated rays by a collimator lens 87 and then, is transmitted through ~~a.~~ a polarization beam splitter (PBS) 88 so as to be incident upon the substrate 82 via a quarter-wave plate 89. The laser beam 86 emitted from the laser diode 85 is linearly polarized light, but is turned into circularly polarized light upon its pass through the quarter-wave plate 89. Reflected light 92 from the substrates 81 and 82 is again transmitted through the quarter-wave plate 89 so as to be turned back into linearly polarized light. However, since direction of polarization of the linearly polarized light 92 is orthogonal to the laser beam 86 during this process, the linearly polarized light 92 is not transmitted through the PBS 88 but is reflected by the PBS 88 so as to be guided to a photodetector 93. The photodetector 93 detects a change of intensity of the reflected light 92, which change is produced when the UV cure resin 84 has been diffused to an inner peripheral region of the substrates 81 and 82.

Please amend paragraph [0065], at pages 19-20, as follows:

[0065] Meanwhile, in the second embodiment, the UV cure resin 65 is dripped from the nozzle 64 so as to be coated on the substrate 61 annularly and then, the substrate 62 is brought into close contact with the substrate 61, such that not only the central bores 20 of the substrates 61 and 62 are made concentric with each other, but the signal recording faces of the substrates 61 and 62 confront each other. However, in the second embodiment, the modification of Figs. 3A and ~~38~~ 3B in the first embodiment may be employed, in which the dispenser 24 is inserted into the minute gap between the dummy substrate 22 and the substrate 21 having the reflective layer 23, so as to annularly fill the UV cure resin 26 between the substrates 21 and 22, while the substrates 21 and 22 are being rotated at low speed and then, the substrates 21 and 22 are brought into close contact with each other so as to be formed integrally. In the method of Fig. 7, if the substrate 62 is brought into close contact with the substrate 61 rapidly, air bubbles may penetrate in between the substrate 62 and the UV cure resin 66. However, in this modification, since the UV cure resin 25 is filled between the substrates 21 and 22 by the dispenser 24, the penetration of air bubbles in between the substrates 21 and 22 does not take place and thus, such an advantage is achieved that tact time for bonding the substrates 21 and 22 to each other can be shortened.

Please amend paragraph [0068], at page 21, as follows:

[0068] Another modification of the method of the second embodiment is described with reference to Fig. 11. In this modification, when UV rays 138 are irradiated to a whole of a substrate 132, so as to wholly cure UV cure resin 134 after the UV cure resin 134 has been fully diffused between substrates 131 and 132, the integral substrates 131 and 132 are gripped between two flat plates, ~~e.g.~~ e.g., a substrate holder 135 and a transparent disk-like glass plate ~~136~~ 136, so as to be subjected to a load. More specifically, the UV cure resin 134 is already filled between the substrate 131 having a reflective layer 133 and the dummy substrate 132. In the method of the present invention, since diffusion of the UV cure resin 134 is detected, diffusion of the UV cure resin 134 is stopped at a predetermined position in an innermost peripheral region of the substrates 131 and 132. In this state, the substrates 131 and 132 are placed on the substrate holder

135 and then, the glass plate 136 is placed on the substrates 131 and 132 so as to apply the load to the substrates 131 and 132 such that tilt of the substrates 131 and 132 is reduced for correction. Since UV rays are transmitted through the glass plate 136, the UV rays 138 are irradiated to the whole of the substrate 132 from above the glass plate 136 by a UV lamp 137 so as to wholly cure the UV cure resin 134. A tilt of a thus obtained optical disk is made smaller than that in the case where a load is not applied to the substrates 131 and 132. This effect of reducing tilt of the optical disk becomes greater as the substrates 131 and 132 become thinner.

Please amend paragraph [0079], at pages 25-26, as follows:

[0079] Therefore, in the third embodiment, when the UV cure resin 211 has been spread to the inner periphery of the substrates 201 and 203, UV rays 208 are irradiated by a UV lamp 206 to only an inner peripheral region of the substrates 201 and 203,~~ i.e.~~ i.e., a UV irradiation region 210, as shown in Fig. 12B, so as to preliminarily cure the UV cure resin 211 at the inner peripheral region of the substrates 201 and 203 only. The UV lamp 206 is covered by a UV shielding cover 207. By irradiating the UV rays 208 to the inner peripheral region of the substrates 201 and 203, a cure region 212 in which the UV cure resin 211 is cured is formed, as shown in Fig. 13. Rotation of the substrates 201 and 203 is further continued for a predetermined period. The UV cure resin 211 at the inner peripheral region of the substrates 201 and 203 is already cured and therefore, does not further thin. However, the UV cure resin 211 from an intermediate peripheral region to an outer peripheral region of the substrates 201 and 203 is not yet cured and becomes thinner upon rotation of the substrates 201 and 203. By rotating the substrates 201 and 203 for the predetermined period, the thickness of the UV cure resin 211 at the outer peripheral region of the substrates 201 and 203 can be made identical with that at the inner peripheral region of the substrates 201 and 203. At this stage, the rotation of the substrates 201 and 203 is stopped and UV rays 214 are irradiated to a whole of the substrate 203 by a UV lamp 213, as shown in Fig. 12C. As a result, the bonding of the substrates 201 and 203 is completed such that thickness of the UV cure resin 211 is uniform from inner periphery to outer periphery of the substrates 201 and 203 and thus, an optical disk 215 is obtained.

Please amend paragraph [0086], at page 28, as follows:

[0086] A step of initially dripping UV cure resin on the first substrate 201 from the nozzle and a step of bringing the second substrate 203 into close contact with the first substrate 201 are performed in the same manner as those of the third embodiment. After the substrates 201 and 203 have been brought into close contact with each other, the substrates 201 and 203 are rotated at high speed by the motor 150 so as to spread the UV cure resin 211. At this time, a thickness of the UV cure resin 211 at an inner peripheral region of the substrates 201 and 203 is measured by a film thickness meter 220, as shown in Fig. 14. The film thickness meter 220 is of reflection type and is capable of measuring a distance from the signal recording layer 202 to an upper face of the second substrate 203,~~ i.e.~~ i.e., a sum of thickness of the UV cure resin 211 and thickness of the second substrate 203. When the substrates 201 and 203 are rotated at high speed, the thickness of the UV cure resin 211 at the inner peripheral region of the substrates 201 and 203 decreases gradually. However, in the fourth embodiment, irradiation of the UV rays 208 to the inner peripheral region of the substrates 201 and 203 is adapted to be started at the time the film thickness meter 220 indicates that the sum of the thickness of the UV cure resin 211 and the thickness of the second substrate 203 has reached a preset value. As a result, even if there are variations of viscosity of the UV cure resin 211,~~ etc.~~ etc., thickness of the UV cure resin 211 at the inner peripheral region of the substrates 201 and 203 can be kept constant at all times.

Please amend paragraph [0091], at page 30, as follows:

[0091] In addition, a plurality of film thickness meters may be provided at an inner peripheral radial position and other radial positions such that UV rays are irradiated to only the neighborhood of the respective radial positions when readings of the film thickness meters have reached a preset value.